




SWORN TRANSLATION

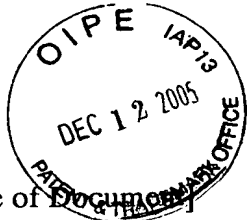
I, Kosaku SUGIMURA, hereby declare and state that I am knowledgeable of each of the Japanese and English languages and that I made the attached translation of the attached application from the Japanese language into the English language and that I believe my attached translation to be accurate, true and correct to the best of my knowledge and ability.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Date: December 7, 2005

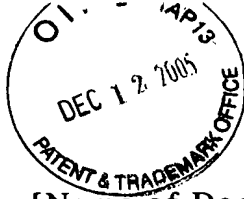
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2000-355449

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[Title of the Invention]	METHOD FOR MANUFACTURING A PNEUMATIC TIRE PROVIDED WITH AN INSERT PLY
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2000-355449

[Name of Document] SPECIFICATION

[Title of the Invention] METHOD FOR MANUFACTURING
A PNEUMATIC TIRE PROVIDED WITH
AN INSERT PLY

[Claims]

[Claim 1] A method for manufacturing a pneumatic tire provided with an insert ply comprising, prior to molding a green tire having insert plies attached on its side portions:

deforming the central portion of a cylindrical carcass band having bead rings attached on both of its marginal portions, by expanding the central portion under a circumstance where both bead rings are converged towards each other;

forming insert plies by applying, on both the side portions of the carcass band separated from each other with the central portion therebetween, reinforcing cords which extend approximately in parallel with the circumferential direction; and then

enhancing the degree of expansion of the carcass band under a circumstance where both bead rings are further converged towards each other, thereby increasing a tension of the reinforcing cords, and at the same time bringing a belt and a tread in contact with the outer face of the crown portion for joining.

[Claim 2] A method as described in claim 1 for manufacturing a pneumatic tire provided with an insert ply wherein the insert ply is formed by continuously turning round a reinforcing cord in a spiral form.

[Claim 3] A method as described in claim 1 or 2 for manufacturing a pneumatic tire provided with an insert ply wherein the enhanced degree of expansion of the carcass band causes the reinforcing cords to be forcibly buried into a coating rubber of the carcass band.

[Detailed Description of the Invention]

[0001]

[Industrial field of the Invention]

The present invention relates to a method for manufacturing a pneumatic tire provided with an insert ply comprising reinforcing

cords which extend in a desired region including a bead portion and a side-wall portion of the tire, approximately in parallel with the tire circumference direction.

[0002]

[Description of the Related Art]

A proposed method for molding a green tire having insert plies in its tire side portions comprises, during a shaping procedure, deforming the central portion of a cylindrical carcass band by emphatically expanding it; bringing its crown portion into intimate contact with the inner face of a belt tread band previously molded into a circular form for joining; and then attaching by adhesion an insert ply composed of reinforcing cords to both side portions of carcass band separated from each other with the crown portion inserted therebetween.

[0003]

[Problems to be Solved by the Invention]

However, the green tire molded by this method poses a number of problems: since the green tire has a low restricting force against the reinforcing cords of insert ply, the reinforcing cords extending in parallel with the circumferential direction may lose their tension as is schematically shown in FIG. 4(a) in association with the deformation or spill of a rubber substance which may occur during vulcanization/molding of the green tire, or may be deformed so much as to take wavy courses as is shown in FIG. 4(b); and thus it may be impossible to obtain a tire product after vulcanization/ molding where the reinforcing cords are given a desired tension as designed, that is, where the tire is shaped as designed.

[0004]

This invention aims at providing a solution to such problems as above that are encountered with the conventional technique, and its object is to provide a method for manufacturing a pneumatic tire with an insert ply useful when a green tire is vulcanized/molded, whereby reinforcing cords constituting an insert ply can be maintained at a

desired position, and thus a tire product with a desired shape as designed can be obtained.

[0005]

[Means for Solving the Problem]

The method of this invention for manufacturing a pneumatic tire with an insert ply comprises, for molding a green tire having insert plies on its side portions, deforming the central portion of a cylindrical carcass band having bead rings attached on both of its marginal portions, by expanding the central portion under a circumstance where the both bead rings are being converged towards each other; forming insert plies by applying reinforcing cords extending approximately in parallel with the circumferential direction onto both side portions separated from each other with the crown portion of carcass band therebetween; and increasing the tension of reinforcing cords by enhancing the degree of expansion of carcass band under a circumstance where the both bead rings are being further converged towards each other, thereby joining the external circumferential face of crown portion to a belt and a tread.

[0006]

According to this method, after application of the insert plies, both bead rings are further converged towards each other, or the foot width of carcass band is further narrowed; because the cross-section of carcass band has a constant length, all the side portion having the insert ply attached thereto is further expanded/deformed outward in the radial direction; a force develops which causes the insert ply, or more accurately the reinforcing cords to elongate their radius; and thus the tension of the reinforcing cords is increased as compared with the tension existent immediately after their application.

[0007]

The reinforcing cords whose tension has been increased satisfactorily withstand forces resulting from the deformation/spill of rubber substance which may occur during the vulcanization/molding of the green tire, and maintain their positions and shape as initially

determined. Thanks to this feature, it is possible to obtain a tire product after vulcanization/molding where the tension of reinforcing forces and the shape of tire product are maintained as designed.

[0008]

If a method is introduced whereby an insert ply is obtained by continuously turning round a reinforcing cord on a side portion of a carcass band in an approximately spiral form, the method is preferable as compared with a method wherein an insert ply is prepared in advance, because with the former method, the need for management and storage of an insert ply can be dispensed with, and the risk of the spiral form of an insert ply being inadvertently modified can be safely avoided.

[0009]

A more preferable variant of this method comprises emphasizing the expansion degree of carcass band, thereby causing the reinforcing cords to be forcibly embedded into a coating rubber constituting the carcass band.

According to this method, the displacement/deformation of reinforcing cords which may arise during vulcanization/molding of a green tire, may be more safely prevented because the reinforcing cords not only are subject to an enhanced tension but also are firmly entrapped by the coating rubber, or in a broader sense by the carcass band.

[0010]

[Embodiments of the Invention]

Preferred embodiments of this invention will be described below with reference to accompanying figures.

FIG. 1 is a drawing of a process representing an embodiment of this invention. Specifically, this is a sectional view of a green tire undergoing a shaping process whereby the central portion of a carcass band is deformed by expansion: the deformation is achieved by a single stage molding wherein a shaping drum which also serves as a carcass band molding drum is used, or by a double stage molding wherein a shaping drum distinct from a carcass band molding drum is used.

[0011]

In the figure, numeral 1 denotes a carcass band. The carcass band 1 shown in the figure is obtained by molding a ply with a carcass band molding drum not illustrated here into a cylindrical shape; two marginal portions are folded back around their respective bead rings 2 placed close thereto together with their respective inner liners not illustrated here to form respective folded-back portions 1a; two bead rings 2, or more directly two bead rocks 3 which support the bead rings on their inner circumferences are converged towards each other; and a pressurized gas is blown directly, or indirectly via a bladder, into the internal space of carcass band 1, such that the central portion extending in the circumferential direction is deformed, being expanded outward in the radial direction.

[0012]

In this particular embodiment, expansion/deformation of the carcass band 1 is temporarily withdrawn at a time point when the distance between the opposite bead rings reaches a predetermined value L_0 as shown in FIG. 1(a). Then, at this interim state, reinforcing cords 4, that is, organic fiber cords or metal cords are applied approximately circularly on both side portions separated from each other with the crown portion of carcass band 1 therebetween, or more preferably a cord is continuously applied on each of the side portions in a spiral form to form thereby an insert ply.

[0013]

Then, the distance between the opposite bead rings are caused to take a smaller predetermined value L_1 as shown in FIG. 1(b). Given the cross-section of carcass band 1 has a constant length, the expansion/deformation degree of the entire side portion is enhanced; a force develops which causes the reinforcing cords 4 of insert ply 5 to elongate their radius; and thus the tension of the reinforcing cords 4 is increased as compared with the counterpart observed immediately after their application.

[0014]

Through this operation, it is possible to cause the reinforcing cords which simply adhere to the surface of a coating rubber of carcass band 1 immediately after their application as shown in FIG. 1(a), to be buried into the substance of the coating rubber, or more preferably to be forcibly buried into the substance of the coating rubber, accompanied with distinct deformations of carcass band 1, or more accurately of carcass cords as shown in FIG. 1(b).

[0015]

Further, with this embodiment, for example, a belt tread band 6 which has been molded on a belt tread band drum is properly positioned against the outer circumferential face of the crown portion of carcass band 1 to be fixed there as shown in FIG. 2, before the distance between the opposite bead rings is shortened to a predetermined value L_1 ; and after the distance between the opposite beads has been shortened to a predetermined value L_1 , the crown portion of carcass band 1 is brought in contact with the inner face of belt tread band 6 for joining, and then firm adherence of the belt tread band 6 to the outer face of carcass band 1 is achieved by using a stitcher roll or the like.

[0016]

The belt tread band 6 may be positioned against the outer face of a shaping drum, before the carcass band 1 is deformed by expansion as indicated in FIG. 1(a), or after expansion/deformation as shown in FIG. 1(a) has been introduced but before formation of insert ply 5 is not started.

[0017]

A green tire having undergone a series of processes as described above, is subjected to general molding processes known in prior art, to complete the molding processes required for the green tire.

[0018]

With a green tire molded as above, because it is possible to increase the tension of the reinforcing cords constituting the insert ply

5 as needed, or more preferably, in addition to above feature, to restrict the reinforcing cords 4 to a desired position, even when the tire is vulcanized and molded in a vulcanizing mold, the reinforcing cords 4 will securely withstand forces which may develop as a result of the deformation or spill of rubber substance during the above process, to maintain the initial, desired position and shape, thereby allowing a tire product where the cord tension and shape are maintained as designed to be produced.

[0019]

The above description has been given in relation to a case where the insert ply 5 is displaced considerably apart on the tire cross-section from the bead ring 2, but what has been described above similarly applies to a case where the insert ply is placed at a region close to the bead ring as shown in FIG. 3.

[0020]

[Advantage]

As discussed above, according to this invention, it is possible to obtain a tire product where reinforcing cords are given a desired tension and the tire has a desired shape, by conferring a sufficiently high tension in accordance with a given requirement on the reinforcing cords constituting an insert ply prior to the vulcanization/molding of the green tire, thereby preventing the reinforcing cords from being subject to displacements and deformations which otherwise might occur during vulcanization/molding.

[Brief Description of the Drawings]

[FIG. 1] This is a drawing of a process representing an embodiment of this invention.

[FIG. 2] This is a cross-section of an example where a belt tread band is joined to a carcass.

[FIG. 3] This is another example where the insert play is differently applied.

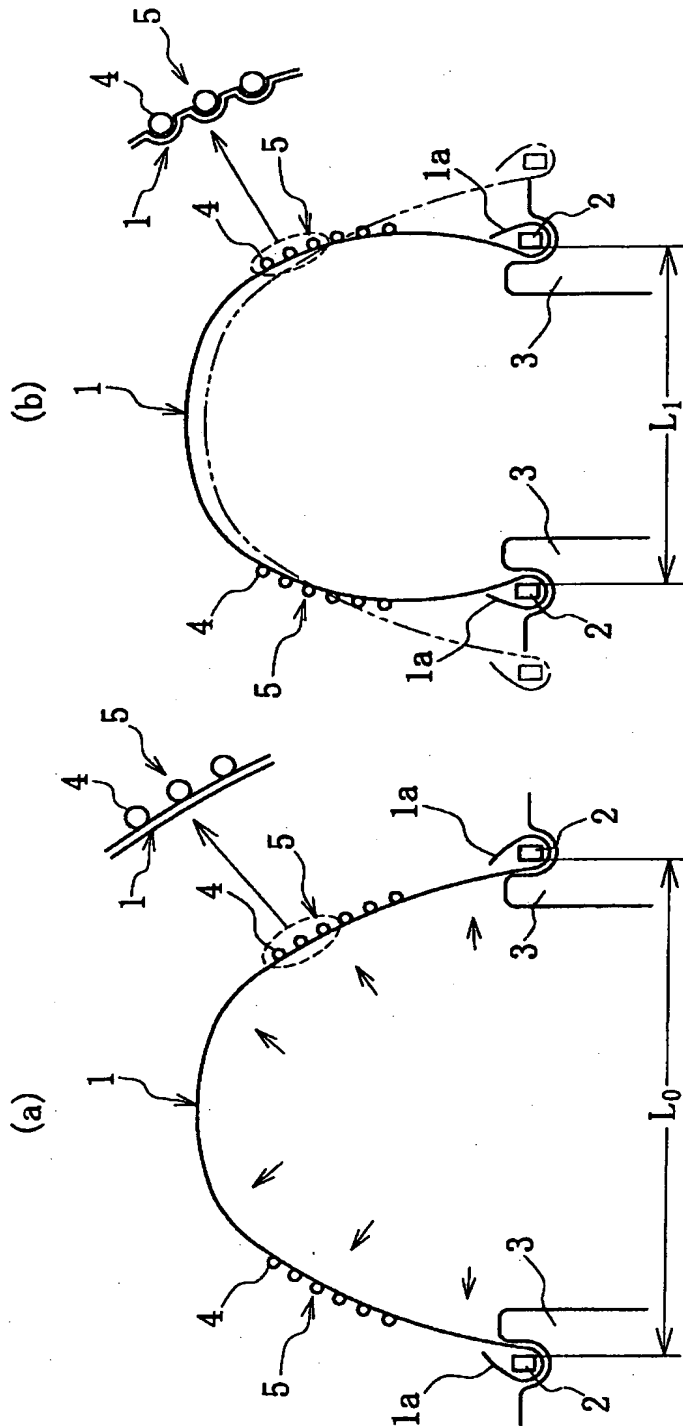
[FIG. 4] This is a schematic drawing of the reinforcing cords in a wavy state.

[Reference Numerals]

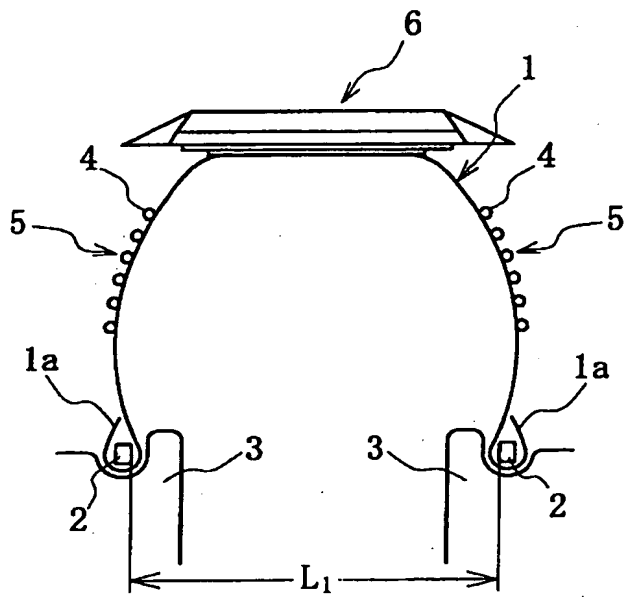
- 1: Carcass band**
- 1a: Folded back portion**
- 2: Bead ring**
- 3: Bead ring**
- 4: Reinforcing cord**
- 5: Insert ply**
- 6: Belt tread band**
- L0, L1: Distance**

整理番号=P204073

【書類名】 図面
[Name of Document] Drawing
【図1】
[Fig. 1]

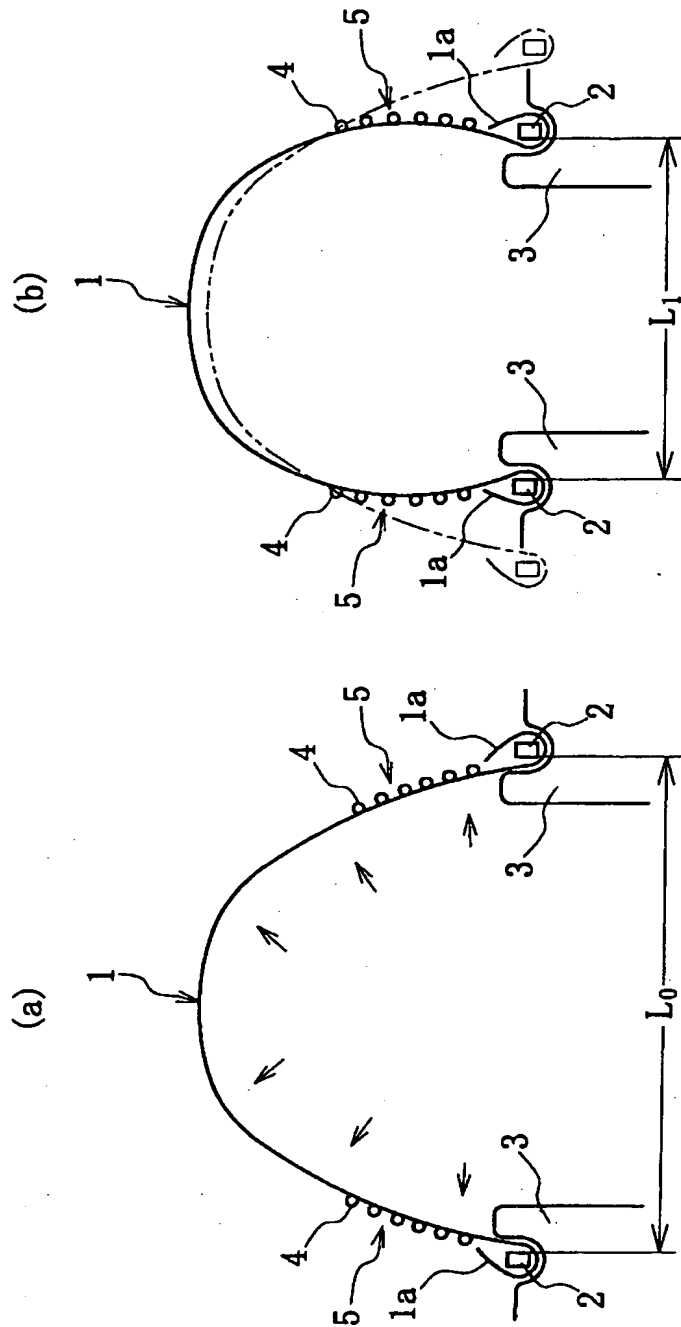


【図2】
[Fig. 2]



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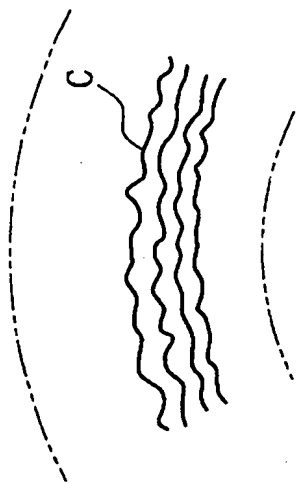
【図3】
[Fig. 3]



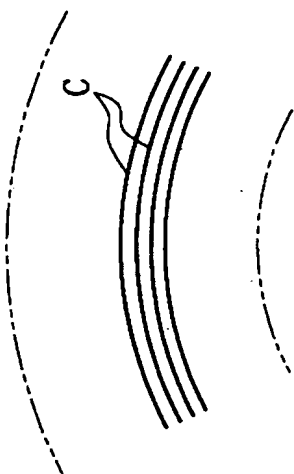
【図 4】

[Fig. 4]

(b)



(a)



[Name of Document] ABSTRACT

[Abstract]

[Object] To obtain a tire product where reinforcing cords are given a desired tension and the tire has a shape as designed, by restricting the reinforcing cords constituting an insert ply to a desired position prior to the vulcanization/molding of a green tire.

[Solving Means] For molding a pneumatic tire having insert plies on both of its side portions, deformation of the central portion of a cylindrical carcass band having bead rings 2 attached on both marginal portions is achieved by expanding the central portion under a circumstance where both bead rings are being converged towards each other; formation of insert plies is achieved by applying reinforcing cords extending approximately in parallel with the circumferential direction onto both side portions separated from each other with the crown portion of carcass band therebetween; and increasing the tension of reinforcing cords is achieved by enhancing the expansion of carcass band under a circumstance where the both bead rings are being further converged towards each other, with the outer circumferential face of crown portion being joined to a belt and a tread.

[Selected Figure] FIG. 1